PATENT ABSTRACTS OF JAPAN

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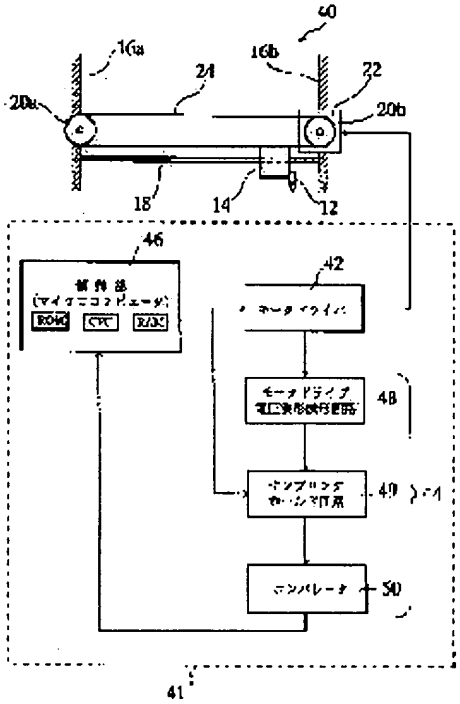
(72)Inventor : SUZUKI HIRONOBU

(54) ORIGIN-POSITION DETECTING DEVICE IN FEED MECHANISM

(57)Abstract:

PURPOSE: To provide an origin-position detecting device of a feed mechanism which can detect quickly its origin position without any origin-position sensor and can shorten a noise generating term in the case of the pull-out of its stepping motor.



CONSTITUTION: An origin-position detecting device 41 of a feed mechanism 40 comprises a motor driver 42 for controlling the rotation of a stepping motor 22, a pull-out detecting portion 44 for detecting the pull-out of the stepping motor 22 and a control portion 46 issuing the command for moving a movable portion 14 in the direction of an origin detecting position when detecting an origin position and issuing the command for stopping quickly the stepping motor 22 in a predetermined excitation state when receiving a pull-out detecting signal from the pull-out detecting portion 44. The pull-out detecting portion 44 comprises a waveform shaping circuit 48 for motor drive voltages which shapes the voltage waveform as responding to the voltage variation in the motor driver 42, a sample-hold circuit 49 for sampling the output voltage of the circuit 48, and a comparator 50 for performing the comparison of a sampled voltage.

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examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

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[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the configuration explanatory view showing one example concerning the home position detection equipment of the delivery device of this invention.
[Drawing 2] It is the conceptual explanatory view showing an example of the structure of PM mold stepping motor.
[Drawing 3] It is the drive circuit diagram showing an example of stepping Motor Driver concerning the home position detection equipment of the delivery device of this invention.
[Drawing 4] It is the timing chart which shows the wave of each part in the home position detection equipment shown in drawing 1 of operation. For (a), drawing showing the pulse shape of each phase in a 1-2 phase excitation method and (b) are the above-mentioned electrical potential difference VA by the side of the A phase when changing to the condition of having carried out step-out from the normal condition. Drawing showing a wave, (c) is the above-mentioned electrical potential difference VB by the side of the B phase when changing to the condition of having carried out step-out from the normal condition. Drawing showing a wave, (d) is the monitor electrical potential difference VA by the side of an A phase. The A phase latch pulse for sampling in each excitation condition and (e) are the monitor electrical potential difference VB by the side of a B phase. It is a B phase latch pulse for sampling in each excitation condition.
[Drawing 5] It is a flow chart Fig. explaining the flow of processing by the control section concerning the home position detection equipment of the delivery device of this example.
[Drawing 6] It is the explanatory view having shown all the excitation patterns in case the moving part attached suitably for a guide rail does step-out.
[Drawing 7] It is the configuration explanatory view having shown an example of the home position detection equipment of a delivery device which performs step-out detection by the control section.
[Drawing 8] It is a flow chart Fig. explaining the flow of processing by the control section concerning the home position detection equipment of the delivery device of other examples.
[Drawing 9] It is the configuration explanatory view showing an example concerning the home position detection equipment of the conventional delivery device.
[Drawing 10] It is the configuration explanatory view showing other examples concerning the home position detection equipment of the conventional delivery device.
[Description of Notations]
14 Moving Part
22 Stepping Motor
40 60 Delivery device
41 61 Home position detection equipment
42 Motor Driver
44 Step-out Detecting Element
46 68 Control section
L1, L2, L3, L4 Excitation winding
RA, RB Resistance for dampers
r1, r2, r3, r4 Internal resistance

[Translation done.]

* NOTICES *

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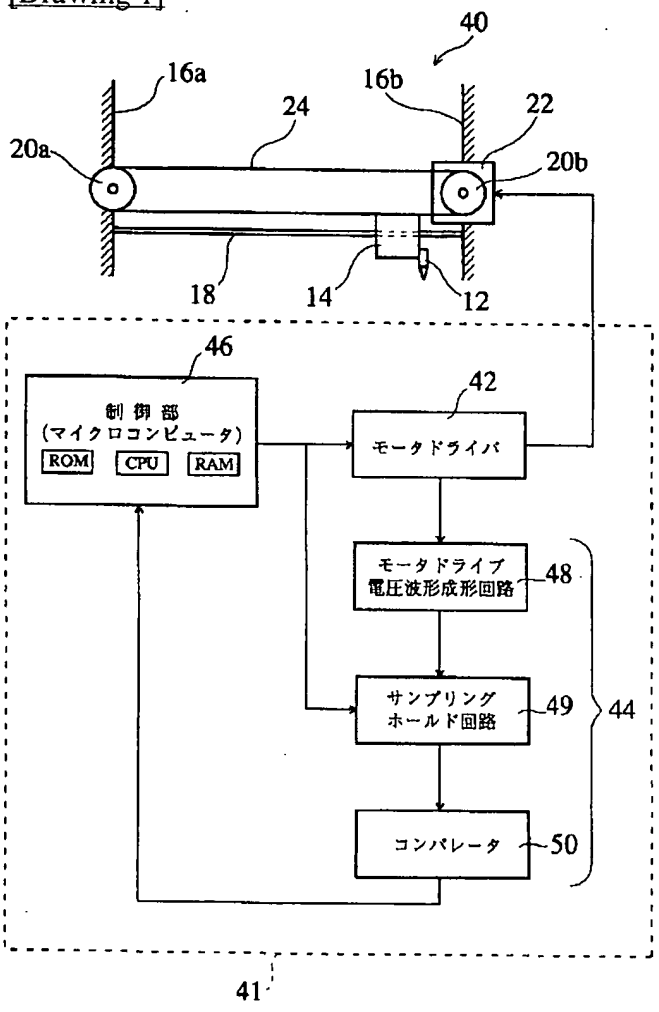
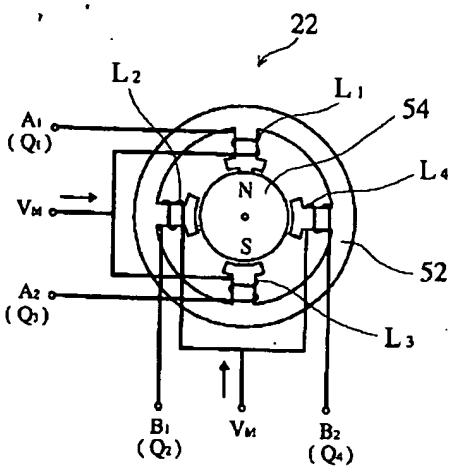
DRAWINGS

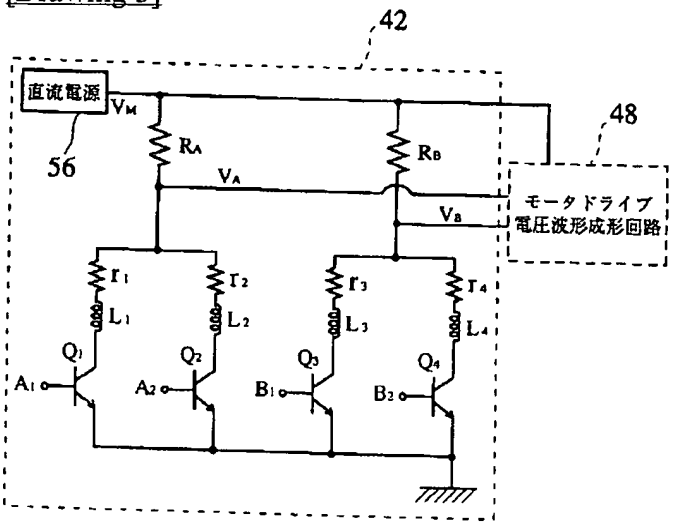
[Drawing 1]



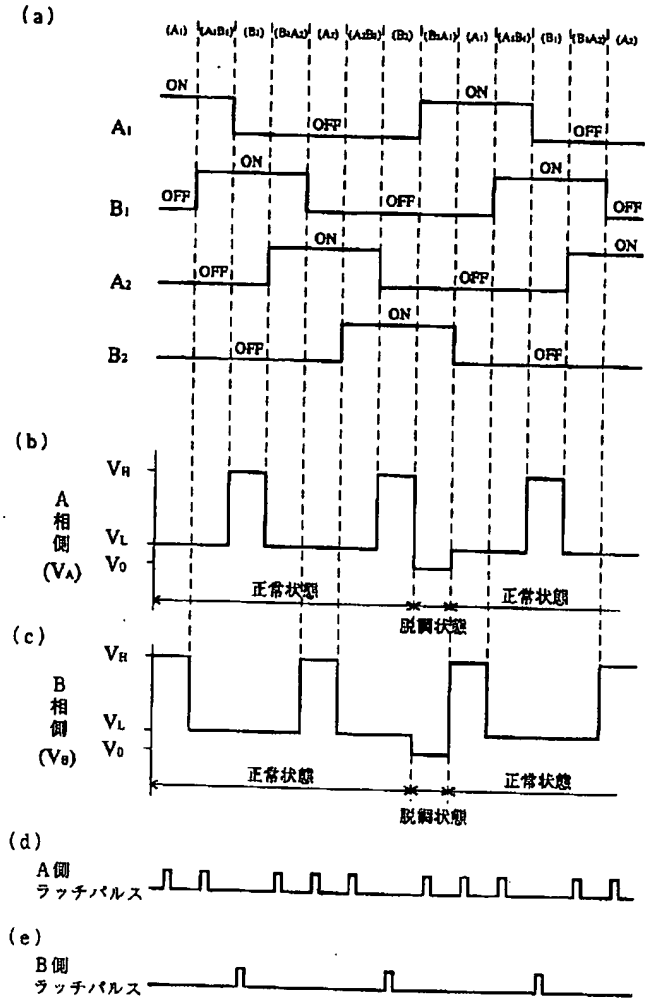
[Drawing 2]



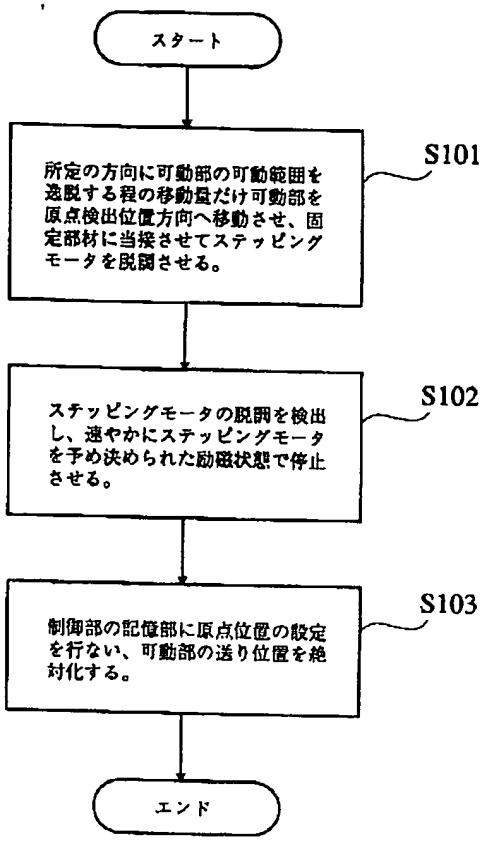
[Drawing 3]



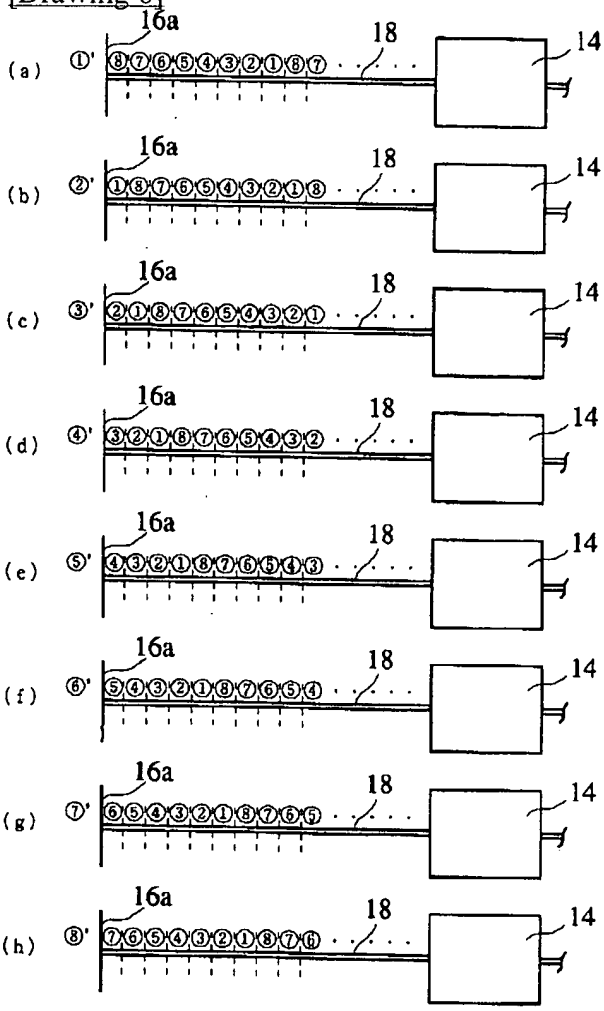
[Drawing 4]


(a)
A1
B1
A2
B2
ON
OFF
(b)
A相側 (VA)
VH
VL
V0
正常状態
脱調状態
正常状態
(c)
B相側 (VB)
VH
VL
V0
正常状態
脱調状態
正常状態
(d)
A側ラッチパルス
(e)
B側ラッチパルス

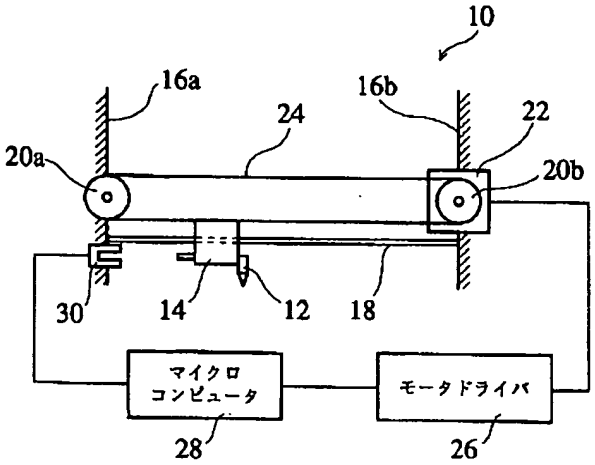
[Drawing 5]


スタート
所定の方向に可動部の可動範囲を逸脱する程の移動量だけ可動部を原点検出位置方向へ移動させ、固定部材に当接させてステッピングモータを脱調させる。
S101
ステッピングモータの脱調を検出し、速やかにステッピングモータを予め決められた励磁状態で停止させる。
S102
制御部の記憶部に原点位置の設定を行ない、可動部の送り位置を絶対化する。
S103
エンド

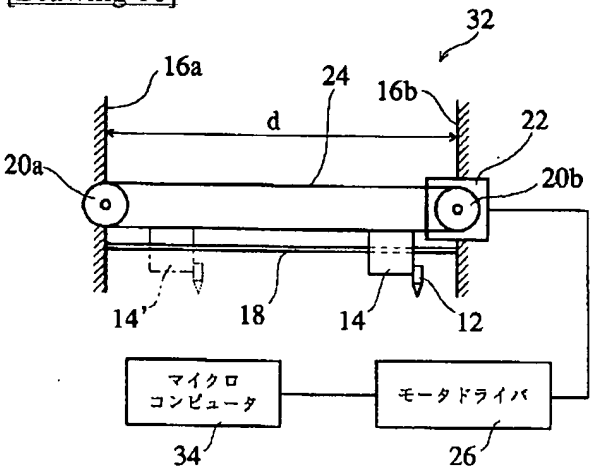
[Drawing 6]


16a
18
14
(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)

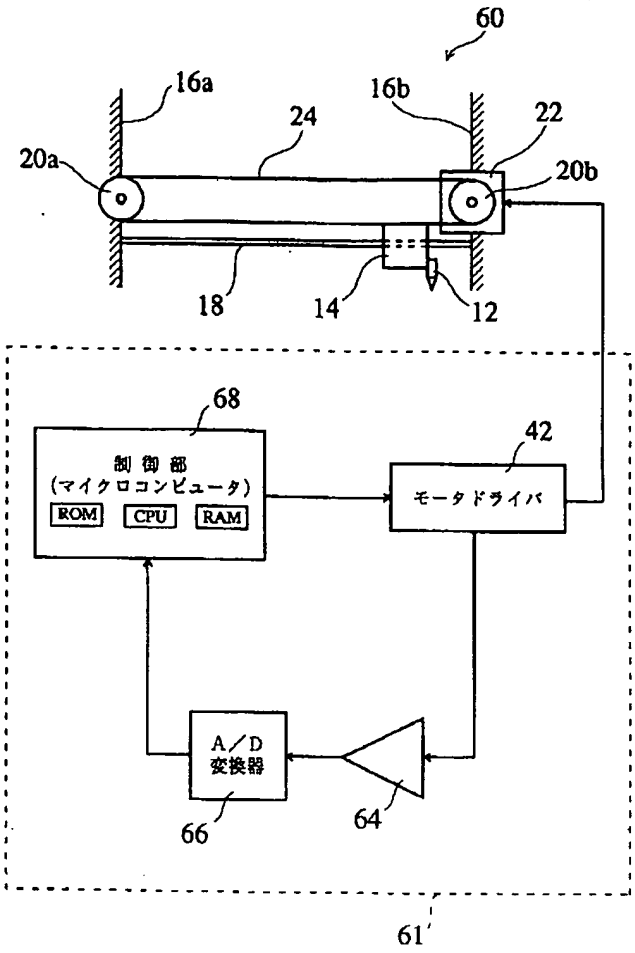
[Drawing 9]



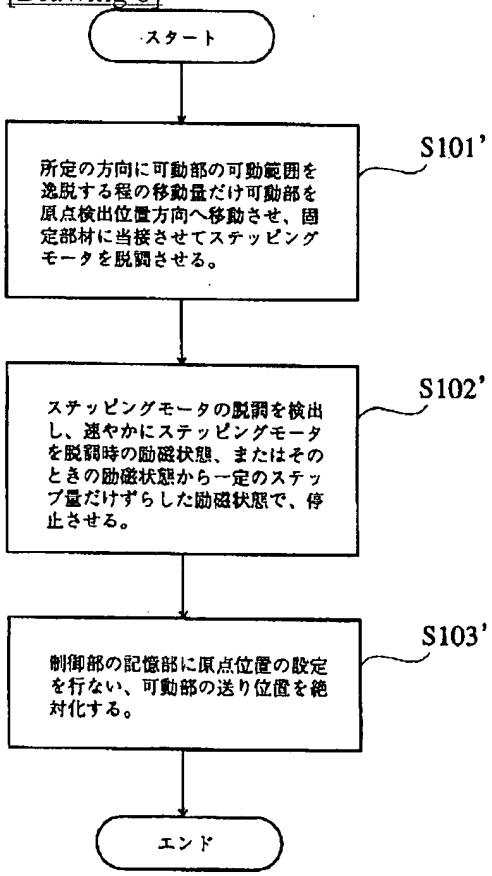
[Drawing 10]



[Drawing 7]


60
16a
16b
24
22
20a
20b
18
14
12
68
制御部
(マイクロコンピュータ)
ROM
CPU
RAM
42
モータドライバ
A／D
変換器
66
64
61

[Drawing 8]


スタート
所定の方向に可動部の可動範囲を逸脱する程の移動量だけ可動部を原点検出位置方向へ移動させ、固定部材に当接させてステッピングモータを脱調させる。
S101'
ステッピングモータの脱調を検出し、速やかにステッピングモータを脱調時の励磁状態、またはそのときの励磁状態から一定のステップ量だけずらした励磁状態で、停止させる。
S102'
制御部の記憶部に原点位置の設定を行ない、可動部の送り位置を絶対化する。
S103'
エンド

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the home position detection equipment which can detect a home position promptly, without using a home position sensor in more detail about the home position detection equipment in the delivery device which used the stepping motor.
[0002]
[Description of the Prior Art] Conventionally, in the plotter, the modeling machine, or the video camera, the delivery device equipped with home position detection equipment is used. The delivery device equipped with this home position detection equipment is supported free [migration] along with the guide rail 18 with which the moving part 14 holding a tool 12 was constructed over two holddown members 16a and 16b, as shown in drawing 9 . And pulley 20a which can rotate freely is arranged in one holddown-member 16a, and the stepping motor 22 which fixed pulley 20b to the revolving shaft is arranged in holddown-member 16b of another side. Furthermore, the endless belt 24 which fixed the above-mentioned moving part 14 is laid by both the above-mentioned pulleys 20a and 20b. Moreover, the microcomputer 28 is connected to the above-mentioned stepping motor 22 through Motor Driver 26. Therefore, if a desired delivery command signal is sent to Motor Driver 26 from the above-mentioned microcomputer 28, Motor Driver 26 which received it will drive a stepping motor 22, and will rotate only the desired amount of steps towards a request of pulley 20b. Consequently, the above-mentioned moving part 14 comes to move only a desired distance towards desired.
[0003] In such a delivery device 10, the home position detection sensor (optical or magnetic type location sensor) 30 for [of moving part 14] getting to know a location absolutely is arranged in one holddown-member 16a, and the above-mentioned sensor 30 is connected to the microcomputer 28. And in the case of home position detection, when moving part 14 is seen off in the direction in which the home position detection sensor 30 was formed and moving part 14 operates the above-mentioned sensor 30, a home position is detected. Moreover, a microcomputer 28 will stop delivery of moving part 14 promptly, if a home position is detected.
[0004] In addition, there is also a delivery device 32 in which it does not have a home position detection sensor as shown in drawing 10 . In this delivery device 32, the home position of moving part 14 is detected by carrying out step-out of the stepping motor 22. That is, in the case of home position detection, when a microcomputer 34 emits the migration command equivalent to movement magnitude, for example, the movement magnitude of migration length d, to the extent that it deviates from the movable range of moving part 14 to Motor Driver 26, moving part 14 is made to contact holddown-member 16a, and step-out of the stepping motor 22 is carried out. And moving part 14 makes the home position the location stopped mechanically. In addition, in the other part of drawing 10 , the same sign is described into the same part as the delivery device shown in drawing 9 , and the explanation about it is omitted into it.
[0005]
[Problem(s) to be Solved by the Invention] In the former delivery device 10, there is a problem that cost goes up in connection with needing the home position detection sensor 30. Moreover, there is a problem that the tooth space for arranging the above-mentioned sensor 30 is needed.
[0006] Although moving-part 14' arrives at a home position shortly after home position detection is performed when moving-part 14' is located near the home position as shown in drawing 10 in order that only movement magnitude to the extent that moving part 14 deviates from the movable range of moving part 14 to be in which location may move in the latter delivery device 32 in the case of home position detection for example, after the stepping motor 22 has carried out step-out, it comes to drive for a while. Thus, even if moving-part 14' is

located near the home position, it is not immediately judged as a home position, but there is a problem of always taking fixed time amount in home position detection.
[0007] Moreover, since the time amount which is carrying out step-out in the case of home position detection becomes long when moving part 14 is located near the home position, the noise generated at the time of step-out continues for a long time, and there is a problem of making a user sensing displeasure.
[0008] This invention was made in view of such a situation, and the place made into the purpose is to offer the home position detection equipment of the delivery device which can shorten noise generating time amount at the time of step-out while being able to perform prompt home position detection, without using a home position sensor.
[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, it is home position detection equipment in the delivery device constituted so that moving part might be moved with rotation of a stepping motor. While emitting Motor Driver which controls rotation of a stepping motor in response to a delivery command signal, the step-out detecting element which detects the step-out of the above-mentioned stepping motor, and the command for which moving part is moved in the zero detection location direction in the case of home position detection the control section which emits a command so that it may be made to stop in the state of the excitation which was able to determine the stepping motor beforehand promptly when a step-out detecting signal is received from the above-mentioned step-out detecting element -- since -- it is making to have been constituted into the 1st summary of this invention.
[0010] Moreover, Motor Driver which is home position detection equipment in the delivery device constituted so that moving part might be moved with rotation of a stepping motor, and controls rotation of a stepping motor in response to a delivery command signal, While emitting the step-out detecting element which detects the step-out of the above-mentioned stepping motor, and the command for which moving part is moved in the zero detection location direction in the case of home position detection The excitation condition at the time of the step-out of a stepping motor is detected promptly [when a step-out detecting signal is received from the above-mentioned step-out detecting element]. the control section which emits a command so that it may be made to stop in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time -- since -- it is making to have been constituted into the 2nd summary of this invention.
[0011]
[Function] That is, a control section moves moving part in the zero detection location direction in the case of home position detection, and step-out of the stepping motor is carried out, and a step-out detecting element detects the step-out immediately, you send a step-out detecting signal to a control section, and the control section which received it makes it stop with the home position detection equipment of the delivery device by this invention in the state of the excitation which was able to determine the stepping motor beforehand promptly. Or when step-out is detected, the excitation condition at the time of step-out is searched for by the operation, and a stepping motor is promptly stopped in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time.
[0012] For example, when moving part is located near the home position in the case of home position detection, moving part arrived at the home position immediately, step-out will be carried out by the stepping motor, the step-out condition is detected immediately, and it comes to suspend a stepping motor in the state of predetermined excitation promptly. Therefore, since the home position detection equipment of this invention is not driven for a while after the stepping motor has carried out step-out like conventional home position detection equipment, the noise generating time amount at the time of step-out becomes short. Moreover, like [at the time of using a home position detection sensor], home position detection comes to be performed by short time amount, so that moving part of a home position is near.
[0013] Moreover, when the above-mentioned stepping motor is PM mold stepping motor of a YURUPORU drive method, it has the step-out detecting element which can detect the step-out of a stepping motor from change of the division ratio of the resistance for dampers connected to the excitation winding of the above-mentioned stepping motor, and the internal resistance of excitation winding, and step-out detection is performed. And a control section will hold Rota of a motor in the state of excitation in the state of predetermined excitation, shortly after receiving the step-out detecting signal made to send from the above-mentioned step-out detecting element. Therefore, the relation of the moving part and the stepping motor which

were suspended mechanically becomes always fixed, and accurate home position detection is performed.
[0014]
[Example] Hereafter, the example concerning the home position detection equipment of the delivery device of this invention is explained with reference to a drawing. Drawing 1 is the configuration explanatory view showing one example concerning the home position detection equipment of the delivery device of this invention. The home position detection equipment 41 in the delivery device 40 consists of Motor Driver 42 which controls rotation of a stepping motor 22 according to a delivery command signal, a step-out detecting element 44 which detects the step-out of a stepping motor 22, and a control section 46 which sends a delivery command signal to above-mentioned Motor Driver 42 as shown in drawing 1 .
[0015] The above-mentioned step-out detecting element 44 acts as the monitor of the electrical-potential-difference change in Motor Driver 42 which makes a stepping motor 22 drive in response to the above-mentioned delivery command signal, and consists of comparators 50 which compare the motor drive electrical-potential-difference corrugating circuit 48 which fabricates a voltage waveform with the electrical-potential-difference change, and the sampling hold circuit 49 which samples the electrical potential difference by which corrugating was carried out according to the pulse sent from the control section 46 with the sampled electrical potential difference and reference voltage. And it connects with the control section 46 and a comparator 50 sends a step-out detecting signal to a control section 46. Moreover, the control section 46 consists of microcomputers containing RAM (storage means) as working area where various registers required at the time of the above-mentioned program execution by ROM and CPU in which the program for control of the whole actuation by CPU (operation means) and CPU etc. was stored etc. were set up. In addition, in the other part of drawing 1 , the same sign is described into the same part as the shown delivery device which is shown in drawing 9 , and the explanation about it is omitted into it.
[0016] The ROM of a control section 46 has the program which sends the command signal which stops a stepping motor 22 in the state of the excitation for which it opted beforehand, when the program for which only movement magnitude to the extent that it deviates from the movable range of moving part 14 sends the delivery command signal which moves moving part in the zero detection location direction to Motor Driver 42 when the command of zero initialization is received from a power up or a control panel (not shown), and the step-out detecting signal from a comparator 50 receive. Moreover, RAM of a control section 46 has the storage region which memorizes as a zero the location of moving part 14 which the stepping motor 22 of the above-mentioned excitation condition is supporting.
[0017] Here, the structure of a stepping motor 22 is briefly explained with reference to drawing 2 . A stepping motor 22 is excitation winding L1, L2, L3, and L4. It is the structure which included cylinder-like permanent magnet Rota 54 in the stator 52 of the shape of a cylinder which has four rolled convex poles, and is A1. A phase and A2 A phase and B1 A phase and B-2 It is the distribution PM mold stepping motor of four phases of a phase. This stepping motor 22 generates torque by the interaction of suction-repulsion of the field and permanent magnet Rota 54 by the current of excitation winding. In addition, this stepping motor 22 is the so-called unipole drive method which passes and drives the current of an one direction to excitation winding, as drawing 2 shows.
[0018] As shown in drawing 3 , moreover, above-mentioned Motor Driver 42 the part which drives a stepping motor 22 by AB2 phase excitation -- the above-mentioned excitation winding L1, L2, L3, and L4 The transistor Q1 linked to an end, Q2, Q3, and Q4 The excitation winding L1 by the side of an A phase, and L2 And the excitation winding L3 by the side of a B phase and L4 They are the resistance RA and RB for dampers to the other end, respectively. It minds and consists of connected DC power supplies 56 for power supply. Therefore, it is based on a delivery command signal from a control section 46, and is a transistor Q1, Q2, Q3, and Q4. If turned on/turned off, sequential excitation of excitation winding L1, L2, L3, and L4 will be carried out, and permanent magnet Rota 54 will rotate.
[0019] Furthermore, the excitation winding L1 by the side of an A phase and L2 And the excitation winding L3 by the side of a B phase and L4 It sets to the other end and they are the resistance RA and RB for dampers. The internal resistance r1 of excitation winding, r2, and r3 and r4 Electrical potential differences VA and VB of a division ratio It acts as the monitor. Corrugating of these electrical potential differences VA and VB is carried out in the motor drive electrical-potential-difference corrugating circuit 48, and that electrical potential difference by which corrugating was carried out is sampled according to the pulse sent from the control section 46 in the sampling hold circuit 49. And the sampling hold circuit 49 creates a latch pulse from the above-

mentioned pulse, and the electrical potential difference sampled by it is sent to a comparator 50 (refer to drawing 1).

[0020] As for a stepping motor 22, an excitation sequence is performed by a plane 1 excitation method, 2 phase excitation method, or the 1-2 phase excitation method. Drawing 4 (a) is drawing showing the pulse shape of each phase in a 1-2 phase excitation method, and the time of transistor-on and a low level serves as [the time of these wave-like high level] transistor-off. As shown in drawing 4 (a), it is A1 ->A1B1 ->B1 ->B1A2 ->A2 ->A2B2 ->B-2 ->B-2 A1... If it excites in sequence, permanent magnet Rota 54 shown in drawing 2 will be rotated in the counterclockwise direction smoothly. the amount of 1 steps at this time -- 45-degree migration -- a variation rate -- it becomes an amount.

[0021] Drawing 4 (b) is the above-mentioned electrical potential difference VA by the side of the A phase when changing to the condition of having carried out step-out from the normal condition. Wave, Drawing 4 (c) is the above-mentioned electrical potential difference VB by the side of the B phase when changing to the condition of having carried out step-out from the normal condition. Wave, Drawing 4 (d) is the monitor electrical potential difference VA by the side of an A phase. The A phase latch pulse for sampling in each excitation condition and drawing 4 (e) are the monitor electrical potential difference VB by the side of a B phase. It is a B phase latch pulse for sampling in each excitation condition. First, the drive of a motor 22 sets in the normal condition so that drawing 4 (b) may show, and it is the monitor electrical potential difference VA by the side of an A phase. When excited by only the B phase, it is high level VH. In the case of an electrical-potential-difference value and the other excitation condition, it is a low level VL. It becomes an electrical-potential-difference value. Moreover, the drive of a motor 22 sets in the normal condition so that drawing 4 (c) may show, and it is the monitor electrical potential difference VB by the side of a B phase. When excited by only the A phase, it is high level VH. In the case of an electrical-potential-difference value and the other excitation condition, it is a low level VL. It becomes an electrical-potential-difference value.

[0022] However, it sets in the condition that the motor 22 is carrying out step-out, and is the internal resistance r1 and r2 of excitation winding, r3, and r4. It becomes small, consequently is the monitor electrical potential difference VA. Or monitor electrical potential difference VB A value is VL. Still lower V0 A value comes to be shown. Therefore, it corresponds to the latch pulse suitable for each excitation condition, and they are the monitor electrical potential differences VA and VB. A sampling is performed and detection of the step-out condition in each excitation condition (each step) is performed.

[0023] And the sampling hold circuit 49 to V0 When the electrical potential difference of a value is sent to a comparator 50, a comparator 50 is the above-mentioned electrical potential difference V0. Reference voltage VM It compares and a step-out detecting signal is sent to a control section 46.

[0024] If a step-out retrieval signal is received, a control section 46 will emit a command to Motor Driver 42 so that it may be made to stop in the state of the excitation which was able to determine the stepping motor beforehand promptly. For example, when a step-out detecting signal is received, it is a transistor Q1. If a control section 46 controls to maintain that excitation condition (A1 for it to excite only to a phase) when turning on, Rota 54 will come to stop in the condition which shows in drawing 2 .

[0025] Here, the delivery location of moving part 14 will turn absolutely by a control section's 46 making a zero the location (step location of a stepping motor) of this moving part 14, and memorizing to RAM.

[0026] Furthermore, drawing 5 is a flow chart Fig. explaining the flow of processing by the control section concerning the home position detection equipment of the delivery device of this example, and explains the flow of processing by the control section 46 with reference to this. First, if a power source is switched on, in step S101, only movement magnitude to the extent that it deviates from the movable range of moving part 14 in the predetermined direction will move moving part 14 in the zero detection location direction, and a control section 46 will make it contact holddown-member 16a, and will carry out step-out of the stepping motor 22.

[0027] Excitation condition, for example, A1, that the step-out of a stepping motor 22 was detected and the stepping motor 22 was able to be promptly decided beforehand by the step-out detecting signal from a comparator 50 in step S102 next It is made to stop in the condition of having excited only to the phase.

[0028] Subsequently, in step S103, a home position is set as the storage section of a control section 46, and the delivery location of moving part 14 is changed absolutely.

[0029] According to this example, they are the resistance RA and RB for dampers. The internal resistance r1 of excitation winding, r2, r3, and r4 Electrical potential differences VA and VB of a division ratio It acts as a monitor, and change of these electrical potential differences VA and VB detects step-out, and he is trying to

stop in the state of the excitation which was able to determine the stepping motor 22 beforehand promptly. Therefore, moving part 14 will stop from the location which contacted holddown-member 16a, or its location in the location surely decided by a maximum of 7 step detached building ****** within the limits.
[0030] Furthermore, with reference to drawing 6 , it explains in detail. Drawing 6 is the explanatory view having shown all the excitation patterns in case the moving part 14 attached suitably for 18 does step-out in the guide rail. Setting to drawing 6 , ** is A1. For a phase and **, an A1B plane 1 and ** are B1. For a phase and **, one AB2 phase and ** are A2. For a phase and **, A2B2 phase and ** are B-2. A phase and the condition of having excited ** to B-2A plane 1 are shown, and numbers with a dash, such as **', show the excitation condition at the time of step-out. Step-out of the delivery device which attached moving part 14 suitably will be carried out to a guide rail 18 in the state of one excitation of **' to **', and this originates in the relation between the installation location of moving part 14, and Rota 54. Therefore, a product (delivery device) becomes either of the excitation patterns shown in (h) from (a) of drawing 6 . For example, like the above-mentioned example, after detecting step-out, it is A1. When a stepping motor 22 is stopped in the condition (excitation condition of **) of having excited only to the phase, the product with the excitation pattern of drawing 6 (a) stops in the location of ** which is separated from seven steps from the location where moving part 14 contacted holddown-member 16b. Moreover, the product with the excitation pattern of drawing 6 (b) stops in the location where moving part 14 contacted holddown-member 16b.
[0031] Thus, although dispersion arises in the halt location of the moving part 14 for every product since a stepping motor 22 stops in the state of the excitation for which it opted beforehand in the case of step-out detection, in each product, moving part 14 will always stop in the regular location. For this reason, accurate home position detection can be performed now.
[0032] In addition, in each mass-produced product, it is also possible by once attaching a home position sensor in a position at the time of a production process, and making ROM of a control section memorize an excitation pattern when a home position sensor detects moving part to make a home position into the surely same location.

[0033] Moreover, in the above-mentioned example, in case a control section 46 is home position detection, move moving part 14 only for movement magnitude to the extent that it deviates from the movable range of moving part 14 in the predetermined direction, holddown-member 16a is made to contact, and step-out of the stepping motor 22 is carried out. Thereby, also when step-out detection is not completed, the drive of a motor should stop automatically.
[0034] Furthermore, although PM mold stepping motor of a YURUPORU drive method is adopted as a stepping motor in the above-mentioned example, the stepping motor of other formats is also employable, and it is Motor Driver which was suitable for it in that case, and it is necessary to adopt the thing in which step-out detection is possible.
[0035] Moreover, the home position detection equipment 61 of the delivery device 60 in which step-out detection can be performed by the control section is shown in drawing 7 . According to this, it is the monitor electrical potential difference VA VB from Motor Driver 42. It incorporates to a control section 68 through a buffer 64 and A/D converter 66, and software processing is made to perform step-out detection within a control section 64. Also in such a configuration, it has the same operation as the example mentioned above. In addition, in the other part of drawing 7 , the same sign is described into the same part as the delivery device shown in drawing 1 and drawing 9 , and the explanation about it is omitted into it.
[0036] As mentioned above, only movement magnitude to the extent that it deviates from the movable range of moving part 14 moves [equipment / of this example / zero detection] moving part 14 in the predetermined direction in the zero detection location direction. When holddown-member 16a is made to contact, step-out of the stepping motor 22 is carried out and the step-out is detected, it was made to stop in the state of the excitation which was able to determine the stepping motor 22 beforehand promptly, the home position was set as the storage section of a control section 46, and the delivery location of moving part 14 is turned absolutely. for this reason, the home position detection equipment of the conventional delivery device -- comparing -- the noise generating time amount at the time of step-out -- short **** -- and the time amount concerning home position detection also becomes short. Moreover, since it is not necessary to use a home position sensor, it is cheap, and, of course, the tooth space for arranging a home position sensor is also unnecessary.
[0037] Below, other examples are explained. Drawing 8 is a flow chart Fig. explaining the flow of processing by the control section concerning the home position detection equipment of the delivery device of other

examples. The control section which processes according to this flow chart Fig. When the command of zero initialization is received from a power up or a control panel (not shown), The program for which only movement magnitude to the extent that it deviates from the movable range of moving part sends the delivery command signal which moves moving part in the zero detection location direction to Motor Driver, and when a step-out detecting signal is received, The excitation condition at the time of the step-out of a stepping motor is detected promptly, and it has the program which emits a command so that it may be made to stop in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time. About the program and configuration in which others were built, it is the same as that of the control section 46 shown in drawing 1 . Moreover, in other examples, the configuration of a delivery device and home position detection equipment is the same as that of what was shown in drawing 1 . Therefore, with reference to drawing 1 and drawing 8 , it explains below that processing of the control section in other examples flows.

[0038] First, if a power source is switched on, in step S101', only movement magnitude to the extent that it deviates from the movable range of moving part 14 in the predetermined direction will move moving part in the zero detection location direction, and a control section will make it contact holddown-member 16a, and will carry out step-out of the stepping motor 22.

[0039] Next, a step-out detecting signal detects the step-out of a stepping motor 22, the excitation condition when carrying out step-out by the operation is searched for in step S102', and a stepping motor 22 is promptly stopped in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time.

[0040] Subsequently, in step S103', a home position is set as the storage section of a control section, and the delivery location of moving part is changed absolutely.

[0041] When step-out detection is carried out, he searches for the excitation condition when carrying out step-out by the operation, and is trying to stop a stepping motor 22 promptly in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time according to this example. For example, when stopped in the state of the excitation at the time of step-out, moving part 14 will stop by 7 step detached building ****** from the location which contacted holddown-member 16a. The product with the excitation pattern of drawing 6 (a) stops in the state of excitation, the location, i.e., **, which is separated from seven steps, from the location where moving part 14 contacted holddown-member 16b. Moreover, the product with the excitation pattern of drawing 6 (b) will stop in the state of excitation of the location, i.e., **, where moving part 14 similarly separated from location 7 step which contacted holddown-member 16b. Therefore, dispersion will not arise in the halt location of the moving part 14 for every product, and moving part 14 will stop from the location which contacted holddown-member 16a, or its location in the same location surely decided by a maximum of 7 step detached building ****** within the limits.

[0042] Thus, in each mass-produced product, when a home position must be made into the surely same location, especially the home position detection equipment shown in this example is effective. That is, since the equipment of this example does not have the need for making a control section memorize an excitation pattern etc. like the equipment in the former example, it is economical.

[0043] In addition, about the other operation effectiveness, since it is the same as that of the former example, explanation is omitted.

[0044]

[Effect of the Invention] As mentioned above, if according to this invention moving part arrives at a home position and a stepping motor carries out step-out in the case of home position detection, the drive of a stepping motor will come to stop promptly in the home position. For this reason, regardless of the location of the moving part before zero detection, noise generating time amount at the time of the step-out in home position detection can be shortened. Moreover, in home position detection, since a home position sensor is not needed, it will become cheap as equipment.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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CLAIMS

[Claim(s)]
[Claim 1] Motor Driver which is home position detection equipment in the delivery device constituted so that moving part might be moved with rotation of a stepping motor, and controls rotation of a stepping motor in response to a delivery command signal, While emitting the step-out detecting element which detects the step-out of the above-mentioned stepping motor, and the command for which moving part is moved in the zero detection location direction in the case of home position detection the control section which emits a command so that it may be made to stop in the state of the excitation which was able to determine the stepping motor beforehand promptly when a step-out detecting signal is received from the above-mentioned step-out detecting element -- since -- the home position detection equipment in the delivery device characterized by being constituted.
[Claim 2] Motor Driver which is home position detection equipment in the delivery device constituted so that moving part might be moved with rotation of a stepping motor, and controls rotation of a stepping motor in response to a delivery command signal, While emitting the step-out detecting element which detects the step-out of the above-mentioned stepping motor, and the command for which moving part is moved in the zero detection location direction in the case of home position detection The excitation condition at the time of the step-out of a stepping motor is detected promptly [when a step-out detecting signal is received from the above-mentioned step-out detecting element]. the control section which emits a command so that it may be made to stop in the state of the excitation which shifted only the fixed amount of steps from the excitation condition at that time, or the excitation condition at that time -- since -- the home position detection equipment in the delivery device characterized by being constituted.
[Claim 3] Home position detection equipment in a delivery device given in any 1 term of claims 1 or 2 characterized by detecting the step-out of a stepping motor from change of the division ratio of the resistance for dampers by which the above-mentioned stepping motor is PM mold stepping motor of a YURUPORU drive method, and the above-mentioned step-out detecting element was connected to the excitation winding of a stepping motor, and the internal resistance of excitation winding.
[Claim 4] Home position detection equipment in a delivery device given in any 1 term of claims 1-3 to which only movement magnitude with it is characterized by being the command for which moving part is moved in the home position detection direction. [fixed like the above-mentioned command for which moving part is moved in the zero detection location direction in the case of home position detection deviates from the movable range of moving part so that a stepping motor may carry out step-out]

[Translation done.]

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